THE

AMERICAN NATURALIST.

Vol. IX.—AUGUST, 1875.—No. 8.

ALASKAN MUMMIES.

BY W. H. DALL.

For nearly a hundred years it has been known, through the quaint accounts of the early voyagers, that certain tribes of southern Alaska preserved the bodies of their dead. Up to a very recent period, however, no examples of this practice had reached any ethnological museum, or fallen under the observation of any scientific observer. When the territory was purchased, had it continued as accessible as during 1868, it might have reasonably been expected to attract many investigators in Natural History and Ethnology, whose chief difficulty would have been an *embarras de richesse*. But private interest and public indifference united to seal it up from inspection. Naturalists generally are less easily muzzled than poorly paid political appointees, and hence the obstacles thrown in the way of exploration have been so great that we can hardly wonder that so few have been able to enter this rich and interesting field.

During the last four or five years, the investigations of M. Alphonse Pinart, and of the writer, have spread among the residents of the territory some knowledge of the value attached to the ethnological material which surrounds them, and to this fact we owe the collection and preservation of much that is of interest. Among other things which have come to hand in this manner are the only specimens of Alaskan mummies extant.

Entered, according to Act of Congress, in the year 1875, by the Peabody Academy of Science, in the Office of the Librarian of Congress, at Washington.

The practice of preserving the bodies of the dead was in vogue among the inhabitants of the Aleutian Islands and the Kadiak archipelago at the time of their discovery, and probably had been the custom among them for centuries. We find nothing of it on the mainland. It is curious to trace the customs of the wild tribes in this respect in connection with their external surroundings. In the Chukchee peninsula on the Asiatic side of Bering Strait, there is no soil in many places. The substratum of granitoid rock is broken by the frost into hundreds of angular fragments, which are covered with a thin coating of various mosses, which may be stripped off in great pieces like a blanket. There are no trees and but little driftwood. Burial is impracticable, cremation impossible, and the natives expose their dead on some hillside to the tender mercies of bears, dogs and foxes.

In the Yukon valley at a short distance below the surface the soil is permanently frozen, and excavation without iron tools extremely difficult. But timber abounds, and the bodies of the dead, doubled up to economize space, are placed in wooden coffins which are secured without nails and elevated above the surface of the earth on four posts. To scare away wild beasts poles are frequently erected around the coffin, bearing long strips of fur or cloth which are agitated by the wind.

The poor and friendless may be simply covered with a pile of logs, secured by heavy stones; but in general the method is as above. Various modifications are found in various localities; the coffin on the lower Yukon is sometimes filled in with clay, packed hard; and the Nowikakhat Indians sometimes place their dead erect, surrounded by hewn timbers secured like the staves of a cask.

On the islands the soil is unfrozen and there are no obstacles to digging. But wood is only found on the shores, drifted by the ocean currents, and usually not in large quantities. However there are no wild animals to disturb the remains; the beetling cliffs which are found on every hand, shattered by frequent earthquakes, afford in the talus of broken rock at their bases, abundant and convenient rock-shelters. Here the natural depositories exist, of which the natives have availed themselves. On all these customs, originally prompted by the bare necessities of the case, the slow development of sentiment and feeling (which undoubtedly does take place in savage people, though we may not be able to

trace its growth) has grafted animistic ideas, and semi-religious rites and ceremonies. Thus, the original utilitarianism is more or less completely masked or concealed. It is a singular fact that no people have ever adopted the plan of committing their dead to the sea.

Without attempting, at present, to trace the growth of the custom, I will briefly describe the method adopted by the Kaniag and Alëut branches of the Eskimo stock, in preserving the dead. The details are partly given in the older voyages; and have been confirmed and supplemented by an examination of a large number of the mummies, and the traditions of the present natives.

The body was prepared by making an opening in the pelvic region and removing all the internal organs. The cavity was then filled with dry grass and the body placed in running water. This in a short time removed most of the fatty portions, leaving only the skin and muscular tissues. The knees were then brought up to the chin, and the whole body secured as compactly as possible by cords. The bones of the arms were sometimes broken to facilitate the process of compression. In this posture the remains were dried. This required a good deal of attention, the exuding moisture being carefully wiped off from time to time. When thoroughly dried the cords were removed and the body usually wrapped in a shirt, made of the skins of aquatic birds with the feathers on, and variously trimmed and ornamented with exceedingly fine embroidery. Over this were wrapped pieces of matting made of *Elymus* fibre, carefully prepared. This matting varies from quite coarse to exceedingly fine, the best rivalling the most delicate work of the natives of Fayal. It is, indeed, quite impossible to conceive of finer work done in the material used.

The matting was frequently ornamented with checks and stripes of colored fibre, with small designs at the intersections of the stripes, and with the rosy breast-feathers of the *Leucosticte* sewed into it. Over this sometimes a water proof material, made from the split intestines of the sea lion sewed together, was placed. The inner wrappings vary in number and kind but they are all referrible to one or the other of the above kinds. Outside of these were usually the skins of the sea otter or other fur animals, and the whole was secured in a case of sealskins, coarse matting or similar material secured firmly by cords and so arranged as to be capable of suspension.

The case was sometimes cradle shaped, especially when the body was that of an infant. On these occasions it was often of wood, ornamented as highly as their resources would allow, painted with red, blue or green native pigments, carved, adorned with pendants of carved wood and suspended by braided cords of whale sinew from two wooden hoops, like the arches used in the game of croquet.

The innermost wrapping of infants was usually of the finest fur, and from the invariable condition of the contained remains it is probable that the bodies were encased without undergoing the process previously described. The practice of suspension was undoubtedly due to a desire to avoid the dampness induced by contact with the soil. The bodies of infants thus prepared were often retained in the house, by the fond mother, for a long time. Afterwards they were sometimes suspended in the open air: but adults were as far as I have been able to find out, invariably consigned to caves or rock-shelters.

Among the localities which have been visited personally by the writer, are caves in Unga, one of the Shumagin Islands, and others on the islands of Amaknak and Atka, further west. In all of these the remains of mummies existed; but the effect of falling rock from above, and great age, had in all the caves except that of Unga, destroyed the more perishable portions of the remains, and in the latter place only fragments remained.

Many stories, however, came to hand in relation to a cave on the "Islands of the Four Mountains" west of Unalashka, where a large number of perfectly preserved specimens were said to exist, in relation to which the following legend was current among the natives.

Many years ago[1] there lived on the island of Kagámil (one of the Four Mountains) a celebrated chief named Kat-hay-a-kut-chak, small of stature but much feared and respected by the adjacent natives for his courage and success in hunting. He had a son whom he fondly loved, and who was about fifteen years old. For this son he made a bidarka (or skin-boat) highly ornamented and of small size. When it was finished, the boy entreated his father for permission to try it, and after much coaxing was permitted to do so, on condition that he did not go far from the shore. After

[1] The date is fixed as being the fall before the spring in which the first Russians made their appearance at these islands, about 1760.

seeing the boat safely launched the father sat on the hillside watching its progress. The boy became interested in the pursuit of a diving bird at which he threw his dart and which receding from the shore carried the boy away in pursuit, forgetful of his promise.

His father shouted to him but the boy was too far away to hear, and presently it becoming dusk, he could no longer see him and the chief returned to his dwelling.

The boy did not become conscious of the distance he had paddled until out of sight of his own island, and in the darkness he made for the nearest shore.

In those days an Alëut marrying into another family was accustomed to leave his wife with her people, at least for a certain time; and a native of another island who had married a daughter of the chief was on his way to visit his wife when he saw a little canoe in front of him and recognized his little brother-in-law. The boy did not however recognize the native, and supposing himself pursued paddled away as fast as he could. The brother-in-law tried to frighten him by throwing darts at his canoe, and threw one so carelessly that it hit the boy's paddle and his canoe overturned. The brother-in-law made all speed to catch up with him and attempted to right the boat; but he could not do it, the boy, as is the custom, being tied into the aperture in the top; until, when he did succeed, he found that the boy was dead. His grief may be imagined, and at first he thought of abandoning the canoe where it was, but on reflection he took it to the landing at Kagámil and securing it in the kelp, that it might not float away, he returned to his own island without having seen his wife.

In the morning the chief's servants brought it in, and, to his great sorrow, Kat-hay-a-kut-chak recognized his beloved son.

He caused the body to be prepared for burial, and when the preparation was complete he sent for all the people of the Four Mountain Islands to unite in the ceremonies of depositing the body in the place where the Alëuts were used to put their dead. The people collected, and together with the chief and his family formed in procession, with songs of lamentation, beating the native tambourines on the way to the burying place. It was autumn and some snow was on the ground which the warm sun had partially melted. On the road lay a large flat stone. The sister of the boy, who was great with child, having her eyes cov-

ered, did not see the stone, slipped, and fell, injuring herself severely, and bringing on premature delivery, which caused her death with that of the infant, on the spot. Now the poor old chief had three to bury instead of one. So he ordered the procession to return to the village, bearing the dead with them.

He then had a cave near his house, which had been used as a place for storage, cleaned out, and after due preparation, the bodies were deposited in this cave, and with them many sea-otter skins, implements, weapons, and all the personal effects of the dead. He then distributed presents and food to the people, saying that he intended to make of this cave, a mausoleum for his family; and that when he himself should die it was his desire to be placed there, with his children. He then told them to eat and drink as much as they desired, but as for himself he should fast and weep for his children. His wishes were carried out, and he was placed in the cave after his death, and since that time the Four Mountain Islands have been abandoned as a place of residence by the natives and only occupied by casual parties of hunters.

The writer attempted in 1873 to reach this locality, but bad weather prevented anchoring; as the shores are mostly precipitous, and there are no harbors. In the summer of 1874, however, the captain of a trading vessel sent there to take off a party of hunters, was guided by some of them to the cave, and succeeded in removing all the perfect mummies and such implements and other ethnological material as could be found. Through the liberality of the Alaska Com. Co. these remains have been received by the National Museum and a careful and detailed account of them has been prepared.

Most of the mummies were wrapped up in skins or matting as previously described, but a few were encased in frames covered with sealskin or fine matting, and still retaining the sinew grummets by which they were suspended. These cases were five-sided, the two lateral ends subtriangular; the back, bottom and sloping top, rectangular, like a buggy top turned upside down.

With them were found some wooden dishes, a few small ivory carvings and toys, a number of other implements, but no weapons except a few lance or dart heads of stone. Two or three women's work bags with their accumulated scraps of embroidery, sinew, tools and raw materials were among the collection.

While space will not suffice here to describe this material in

detail, it may be mentioned that it contained thirteen complete mummies, from infants to adults, two of which were retained in California; and two detached skulls.

None of the material showed any signs of civilized influences, all was of indigenous production, either native to the islands, or derived from inter-native traffic or drift wood. The latter comprised a few pieces of pine resin and bark, birch bark, and fragments of reindeer skin from Aliaska Peninsula.

It will thus be seen that this is one of the most important additions to our knowledge of the prehistoric condition of these people. So far as the specimens differed from those in use in more modern times they resembled more nearly the implements in use among the Eskimo of the mainland. The remains are all those of true aboriginal Alëuts.

The Kaniagmut Eskimo, inhabiting the peninsula of Aliaska, the Kadiak archipelago and the islands south of the peninsula, added, to the practice of mummifying the dead, the custom of preparing the remains in some cases in natural attitudes, dressing them in elaborately ornamented clothing sometimes with wooden armor, and carved masks. They were represented, women as serving or nursing children; hunters in the chase, seated in canoes and transfixing wooden effigies of the animals they were wont to pursue; old men beating the tambourine, their recognized employment at all the native festivals. During the mystic dances, formerly practised before a stuffed image, the dancers wore a wooden mask which had no eye-holes, but was so arranged that they could only see the ground at their feet. At a certain moment they thought that a spirit, whom it was death or disaster to look upon, descended into the idol. Hence the protection of the mask. A similar idea led them to protect the dead man, gone to the haunts of spirits, from the sight of the supernatural visitor. After their dances were over the temporary idol was destroyed.

We found many relics of this practice in the Unga Caves.

In Kadiak still another custom was in vogue. Those natives who hunted the whale formed a peculiar caste by themselves. Although highly respected for their prowess and the important contributions they made to the food of the community, they were considered during the hunting season as unclean. The profession descended in families and the bodies of successful hunters were preserved with religious care by their successors. These mum-

mies were hidden away in caves only known to the possessors. A certain luck was supposed to attend the possession of bodies of successful hunters. Hence one whaler, if he could, would steal the mummies belonging to another, and secrete them in his own cave, in order to obtain success in his profession.

While M. Pinart was in Kadiak, he heard of the existence of one of these mummies but was unable to discover the locality. Afterwards Mr. Sheeran, the U. S. Deputy Collector of the port of Kadiak, through a peculiar superstition of the christianized(?) natives, was able to discover and secure it. It appears that though nominally all members of the Greek Church they still have great faith in the superstitions of their ancestors, and while the whaleman's superstition has passed away, the natives still regarded the mummy as possessing the power of averting the ill nature of evil spirits, and consequently were accustomed to take to it the first berries and oil of the season. This they asserted, the mummy ate, as the dishes were always empty when they returned for them. Thus annually, they furnished the foxes and spermophiles with a feast. By watching, when the spring offering was made, the locality was detected. The mummy was secured by Mr. Sheeran and placed in an outbuilding near his house. During the season the natives came to him and remonstrated at his not feeding the dead man sufficiently; for he had been seen by a native watchman one foggy night, prowling about the town, presumably in search of food.

This mummy was only covered with a tattered gut-shirt or kamlayka, was in a squatting posture, and held in his hand a stoneheaded lance, on the point of which was transfixed a rude figure cut out of sealskin, supposed by the natives to represent the evil spirits which he held in check. It was that of a middle aged man with hair and tissues in good preservation.

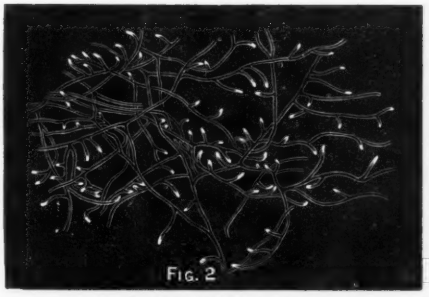
BIOGRAPHIES OF SOME WORMS.

BY A. S. PACKARD, JR.

VI. THE POLYZOA.

The Polyzoa or moss animals derive their common name from their resemblance to mosses. For example, the fresh water *Frederi-*

Fig. 185.



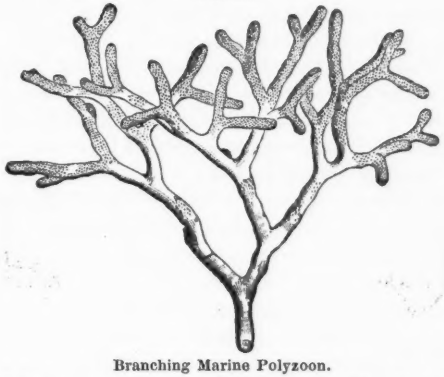
Fresh water Polyzoon.

Fig. 186.

Sea mat.

cella Walcottii (Fig. 185, after Hyatt) would easily be mistaken for moss growing on a submerged stick. The marine species have small-

Fig. 187.



Branching Marine Polyzoon.

er cells and form mat-like encrustations, as in Membranipora (Fig. 186, cells enlarged); or as in *Myriozoum subgracile* (Fig. 187),

they form a coral-like branching mass. On magnifying these cells when the animal is alive and extended from its cell, each polypide, as it is called, appears with its crown of tentacles somewhat like a Sabellid worm. This crown of tentacles surrounds the mouth, which leads by an œsophagus into the throat and a stomach, the latter bent so that the intestine beyond ends very near the mouth; the polypide is thus bent on itself within the cell (cystid) and its body is drawn in and out by muscles. Attached to the end of the fold of the stomach is a cord (funiculus) holding the ovary in place, which extends back to the end of the cystid, as we may call the cell.

Allman regards the polypide and cystid as separate individuals. Now in confirmation of this view we have the singular genus Loxosoma, which is like the polypide of an ordinary Polyzoan, but does not live in a cell. On the other hand, we know of no cystids which are without a polypide (Nitsche).

The affinities of the Polyzoa to the worms are quite decided. In the Phoronis worm, which is allied to Sipunculus, we have the alimentary canal flexed, and the anus situated near the mouth. The Polyzoa have but a single pair of nerve ganglia, and in some cases a tubular heart. The fresh water species are the higher, and are called Phylactolæmata; the marine species are termed Gymnolæmata. All the Polyzoa are hermaphrodite, the ovaries and male glands residing in the same cystid.

Development of the Polyzoa.—Remembering that the cystids stand in the same relation to the polypides as the hydroids to the medusæ, as Nitsche insists, we may regard the polypides as secondary individuals, produced by budding from the cystids. The large masses of cells forming the moss animal, which is thus a compound animal, like a coral stock, arises by budding out from a primary cell. The budding process begins in the endocyst, or inner of the double walls of the body of the cystid, according to Nitsche, but according to an earlier Swedish observer, F. A. Smitt, from certain fat bodies floating in the cystid.

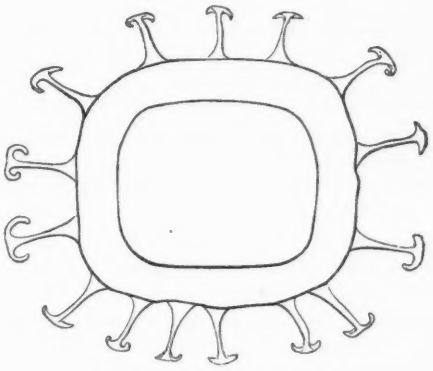
Nitsche has observed the life history of *Flustra membranacea*. He has traced the budding of one cell or zoœcium (representing the cystid individual) from another. During this process the polypide within decays, leaving as a remnant the so-called "brown body," regarded by Smitt as a secretion of the endocyst and germ of a new polypide. After the loss of its first polypide, it can pro-

duce a new one by budding from the endocyst on the side of the stomach. In Loxosoma, young resembling the adult, bud out like polyps.

Nitsche does not regard this budding process as an alternation of generations, but states that in Polyzoa of the family Vesiculariidæ, this may occur, as in them some cystids form the stem, and others (the zoœcia) produce the eggs.

The Polyzoa produce winter and summer eggs, the winter eggs, called *statoblasts*, being protected by a hard shell. Fig. 188, after

Fig. 188.



Egg of Pectinatella magnifica.

Hyatt, represents the winter egg of *Pectinatella magnifica*, with spines. These winter eggs crowd the zoœcia, and may be found in them after the polypides have decayed.

Grant first described the ciliated young of the Polyzoa. The Swedish naturalists, Lovén and Smitt, have described the development of the young *Lepralia pallasiana*, which, after passing through a true morula condition, issues from the egg as a flattened ciliated sphere with a single band of larger cilia surrounding one end.

Fig. 189.

Polyzoon larva.

Our figure (189) is copied from Claparède's memoir, and represents the larva of *Bugula avicularia* immediately after escaping from the egg. After swimming about for a while as a spherical ciliated larva, with a bunch of larger cilia (flagellum) at one end, it elongates, looses its cilia and

flagellum, and soon the polypide grows inside, the stomach and tentacles arise, and finally the polypide is formed.

In conclusion, the Polyzoa increase (a) by budding, (b) by normal eggs and winter eggs. In reproducing from eggs the young passes through:

1. Morula state.
2. Trochosphere, much as in certain worms and mollusks, attaining the
3. Adult condition (zoœcium).

LITERATURE.

Smitt. Bidrag till Kännedomen om Hafs-Bryozoernas utveckling.

——— Om Hafs-bryozoernas utveckling och Fettkroppar. (Ofversigt af K. Vet. Akad. Förh. 1865.)

Nitsche. Beiträge zur Anatomie und Entwickelungsgeschichte der phylactolämen Süsswasserbryozoen. (Archiv für Anat. u. Phys. 1868.)

——— Beiträge zur Kenntniss der Bryozoen. (Siebold und Kölliker's Zeitschrift, 1871.)

Claparède. Beiträge zur Anatomie und Entwicklungsgeschichte der Seebryozoen. (Siebold und Kolliker's Zeitschrift, 1870.)

Consult also papers by Grant, Lovén, Huxley, Hyatt and Hincks.

VII. THE BRACHIOPODA.

While the Brachiopods have been regarded by many as closely related to the Polyzoa, there are many features, as insisted on by Prof. Morse, which closely ally them to the Chætopod worms. In his treatise "On the systematic Position of the Brachiopoda,"[1] Morse has given conclusive reasons for removing them from the mollusks and placing them among the worms, and even, in his opinion, among the Chætopods, the highest division of worms. He thus, after giving the anatomical facts in his view sustaining his position, concludes that ancient Chætopod worms culminated in two parallel lines, on the one hand, in the Brachiopods, and on the other, in the fixed and highly cephalized Chætopods.

On the other hand Mr. A. Agassiz, swayed by their relationship to the Polyzoa, remarks that "the close relationship between Brachiopods and Bryozoa cannot be more fully demonstrated than by the beautiful drawings on Pl. v., of Kowalevsky's history of Thecidium. We shall now have at least a rational explanation of the homologies of Brachiopods, and the transition between such types as Pedicellina to Membranipora and other incrusting Bryozoa, is readily explained from the embryology of Thecidium. In

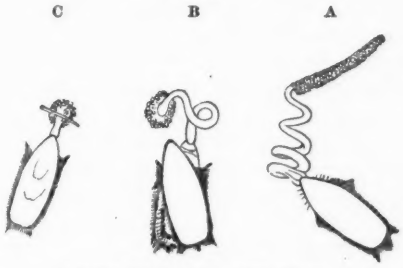
[1] Proceedings of the Boston Society of Natural History, xv, 1873.

fact, all incrusting Bryozoa are only communities of Brachiopods, the valves of which are continuous and soldered together, the flat valve forming a united floor, while the convex valve does not cover the ventral valve, but leaves an opening more or less ornamented for the extension of the lophophore."[1]

In his first paper on the "Earlier Stages of the Terebratulina" Morse had shown the same relationship between the young Brachiopod and the Pedicellina.

The two commonest forms on our coast are the *Terebratulina septentrionalis*, found attached to stems or shells in the seas of New England, while the *Lingula pyrimidata* (Fig. 190, A, with the peduncle perfect, retaining a portion of the sand tube; B, showing the valves in motion, the peduncle broken and a new sand case be-

Fig. 190.



Lingula pyrimidata. After Morse.

ing formed; C, the same with the peduncle broken close to the body, after Morse) is common in sand between tide marks, from North Carolina to Florida. It is usually free, but sometimes attached.

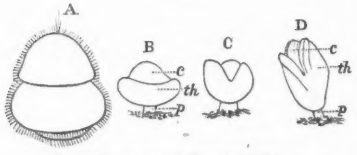
Development of the Brachiopods. The life-history, from the time that it leaves the egg until it attains maturity, of our common lampshell, *Terebratulina septentrionalis*, has been told by Prof. Morse. Before his account appeared our knowledge was extremely fragmentary. Morse believes that in all the Brachiopods the sexes are separate. The eggs (Fig. 192, A), he says, as in the Annelida, when arrived at maturity, escape from the ovaries into the general cavity of the body, and are thence gathered up by the segmental organs, or oviducts, and discharged into the surrounding water. Whether they are fertilized after they leave the

[1] Amer. Journ. Sc. and Arts, Dec., 1874.

parent or before, is not settled. In a few hours after they are discharged the embryos hatch and become clothed with cilia. The earliest stages of the egg of Brachiopods before the larva hatches, were studied by Kowalevsky after the publication of Morse's researches. The Russian zoologist observed in the egg of Thecidium the total segmentation of the yolk (also observed in Terebratulina by Morse), until a blastoderm (ectoderm) is formed around the central segmentation cavity, which contains a few cells. The similar formation of the blastoderm was seen in Argiope, but not the morula stage. After this the ectoderm invaginates and a cavity is formed, opening externally by a primitive mouth. The walls of this cavity now consist of an inner and outer layer (the endoderm and ectoderm). This cavity eventually becomes the digestive cavity of the mature animal. After this the development goes on as previously described by Morse, Kowalevsky's discoveries confirming those of the former observer.

In Terebratulina Morse observed that the oval ciliated germ became segmented, dividing into two and then three rings, with a tuft of long cilia on the anterior end (Fig. 191, A). In this stage the larva is quite active, swimming rapidly about in every direction.

Fig. 191.



Larval stages of Terebratulina.

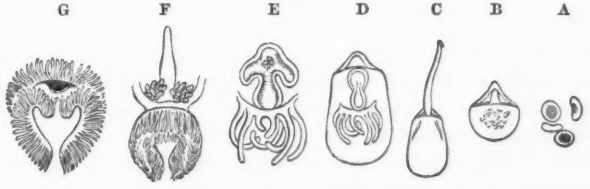
Soon after, the germ looses its cilia and becomes attached at one end as in Fig. 191, B (*c*, cephalic segment; *th*, thoracic segment; *p*, peduncular or caudal segment). The thoracic ring now increases much in size so as to partially enclose the cephalic segment, as at Fig. 191, C. The form of the Brachiopod is then soon attained, as seen in Fig. 191, D, in which the head (*c*) is seen projecting from the two valves of the shell (*th*), the larger being the ventral plate.

The hinge margin is broad and slightly rounded when looked at from above; a side view however, presents a wide and flattened area, "as is shown in some species of Spirifer, and the embryo for a long time assumes the position that the Spirifer must have assumed." Before the folds have closed over the head, four bundles of bristles appear; these bristles are delicately barbed like those of larval worms. The arms, or cirri, now bud out as two promi-

nences, one on each side of the mouth. Then as the embryo advances in growth the outlines remind one of a Leptæna, an ancient genus of Brachiopods, and in a later stage the form becomes "quite unlike any adult Brachiopod known."

The deciduous bristles are then discarded, and the permanent ones make their appearance, two pairs of arms arise, and now the shell in "its general contour recalls Siphonotreta, placed in the family Discinidæ by Davidson, a genus not occurring above the Silurian." No eye spots could be seen in Terebratulina, though in the young Thecidium they were observed by Lacaze-Duthiers. The young Terebratulina differs from Discina of the same age in being sedentary, while, as observed by Fritz Müller, the latter "swims freely in the water some time after the dorsal and ventral plates, cirri, mouth, œsophagus and stomach have made their appearance." Discina also differs from Terebratulina in having a long and extensible œsophagus and head bearing a crown of eight cirri or tentacles. Regarding the relations of the Brachiopods with the Polyzoa, Morse suggests that there is some likeness between the embryo Brachiopod, and the free embryo of Pedicellina. Fig. 192, B, represents the Terebratulina when in its form it recalls Megerlia or Argiope. C represents a later Lingula-like stage. "It also suggests," says Morse, "in its movements the nervously acting Pedicellina. In this and the several succeeding stages, the mouth points directly backward (forward of authors), or away

Fig. 192.



Later stages of Terebratulina.

from the perpendicular end (D) and is surrounded by a few ciliated cirri, which forcibly recall certain Polyzoa. The stomach and intestine form a simple chamber, alternating in their contractions and forcing the particles of food from one portion to the other." Figure 192, E, shows a more advanced stage, in which a fold is seen on each side of the stomach; from the fold is developed the

complicated liver of the adult, as seen in E, which represents the animal about an eighth of an inch long. The arms (lophophore) begin "to assume the horse-shoe-shaped form of Pectinatella and other high Polyzoa. The mouth at this stage begins to turn towards the dorsal valve (ventral of authors), and as the central lobes of the lophophore begin to develop, the lateral arms are deflected as in F. In these stages (G) an epistome[1] is very marked, and it was noticed that the end of the intestine was held to the mantle by an attachment, as in the adult, reminding one of the *funiculus* in the Phylactolæmata" (Polyzoa). Turning now to Kowalevsky's memoir, he shows, according to Mr. A. Agassiz, that the larvæ of Brachiopods are strikingly like those of the Annelides. "The homology between the early embryonic stages of Argiope with well known Annelid larvæ is most remarkable, and the resemblance between some of the stages of Argiope figured by Kowalevsky and the corresponding stages of growth of the so-called Lovén type of development among Annelides is complete. The number of segments is less, but otherwise the main structural features show a closeness of agreement which will make it difficult for conchologists hereafter to claim Brachiopods as their special property. The identity in the ulterior mode of growth between the embryo of Argiope and of Balanoglossus, in the Tornaria stage, is still more striking. We can follow the changes undergone by Argiope while it passes through its Tornaria stage, if we may so call it, and becomes gradually, by a mere modification of the topography of its organs, transformed into a minute pedunculated Brachiopod, differing as far from the Tornaria stage of Argiope as the young Balanoglossus differs from the free swimming Tornaria. In fact, the whole development of Argiope is a remarkable combination of the Lovén and of the Tornaria types of development among worms."

At the close of his first memoir Morse again insists on the close relationship of the Brachiopods and Polyzoa; these views, taken with his later views as to the close relationship of Lingula with the Chætopod worms, show how intimately the Polyzoa and Brachiopods are bound together with the Annelides.

---

[1] The free lip seemed to perform all the functions pertaining to the epistome in the higher Polyzoa, and we find it on the inner bend of the arms, as in the Polyzoa, though not occupying the same homological position in regard to the flexure of the intestine." Early stages of Terebratulina, p. 34.

It will be seen that neither in the Polyzoa nor Brachiopods are there any true molluscan characters, nothing homologous with the foot, the shell gland or odontophore. The Brachiopods should in our opinion be, perhaps, united with the Polyzoa and form a group lower but sub-parallel with the Annelides. The Brachiopods, from the facts afforded by Morse and others, have neither such a nervous system or respiratory or circulating organs, or an annulated body, as would warrant their union with the Chætopods. He has fully proved that they are a synthetic type, combining the features of different groups of worms, and this fact apparently forbids their being regarded as a group of Chætopods. Looking at the subject from an evolutional point of view, we should be inclined to regard the Brachiopods and Polyzoa as derived from common low vermian ancestors, while the Chætopod worms probably sprang independently from a higher ancestry.

To sum up, the Brachiopods pass through

1. A Morula state.

2. A free swimming, ciliated Gastrula condition, formed by invagination of the ectoderm.

3. Free swimming larval annulate Cephulala stage, combining the characters of the larva of Nareda and of Tornaria the larva of Balanoglossus.

LITERATURE.

Morse. On the Early Stages of *Terebratulina septentrionalis.* (Memoirs Boston Soc. Nat. Hist., 1869.)

———. Embryology of Terebratulina. (Memoirs Bost. Soc. Nat. Hist., 1873.)

Kowalersky. Investigations upon the Development of Brachiopoda, Moscow, 1874. With papers by Oscar Schmidt, Lacaze-Duthiers, F. Müller and McCrady.

ON ERGOT.[1]

BY WILLIAM CARRUTHERS, F.R.S.

Ergot might supply an interesting text from which to exhibit the worthlessness of speculation as opposed to observation and experiment in dealing with natural science. Replacing, as it does, the seeds of different grasses, and always attaining, when full grown, a greater size than the normal seed, it was at first thought to indicate an extra quantity of life and vigour in the particular seed, which exhausted themselves in the production of the anomalous horned grain. No special properties were associated with these abnormal productions. All along the ergot had been exerting its baneful influence on man and animals without being suspected. Through its agency the inhabitants of whole districts in France had been visited with intermittent attacks of gangrenous diseases; and England, as Professor Henslow has shown in the pages of the 'Journal of the Royal Agricultural Society of England' (vol. ii. pp. 14–19), has records of similar though not so extensive calamities. Yet many years have not elapsed since these and other evils have been traced to their true source,—the consumption of ergotted corn as food.

The remarkable action of ergot on the gravid uterus is well known, and has caused it to be used for many years as a powerful aid in cases of difficult or prolonged parturition. It has been more recently determined that its power of causing muscular contraction extends to all unstriped or involuntary muscular fibre, and it has consequently been applied in treating certain maladies connected with the intestinal canal and the arteries, because these organs, like the gravid uterus, are chiefly composed of this kind of muscular tissue.

The 'Journal of the Royal Agricultural Society of England,' and other periodicals devoted to agricultural subjects, contain frequent narratives of the injuries to stock resulting from the occurrence of ergot in grass crops. Mr. H. Tanner records the loss to one breeder of cattle in Shropshire of 1200*l.* in three years from this cause (vol. xix, p. 40). Recent losses, especially in

[1] From the Journal of the Royal Agricultural Society of England, 1874.

the casting of foals by valuable brood mares, having again drawn attention to the matter, I propose to set down what is known regarding this dangerous production. This is the more necessary, because the views of the latest writers in the 'Journal' on this subject were published before the very important observations of Tulasne were known. This eminent fungologist has fully traced the history and development of ergot, and has finally set at rest the many doubts entertained as to its true nature.

Like all diseases which result from the attacks of fungi, the appearance of ergot is mysterious and more or less inexplicable. Atmospheric conditions, without doubt, greatly influence the development of such plants. Moisture is required for the growth of the minute spores of fungi, which at all times abound in the air: a moist and warm atmosphere invariably brings in all suitable localities a large crop of these minute epiphytic or parasitic fungi. Such conditions, it is well known, greatly favour the production and development of the potato fungus. Ergot also is most abundant in wet seasons; and in the fields where it is seen, it has been found in the greatest abundance in those parts which are low or undrained. Such physical conditions are, however, not present in every instance of the rapid progress of a parasitic fungus. The recent appearance of a blight among garden hollyhocks, and their allies, the wild mallows, is a remarkable exception. This minute fungus (*Puccinia malvacearum*, Mont.) was described by Montagne from Chili, of which country it appears to be a native. It was afterwards noticed in Australia; and a year ago it appeared for the first time in England, in such abundance that it was observed almost everywhere in the south, and in some places not a single Malvaceous plant, wild or cultivated, could be found that had not been attacked by it. It is reported in the same abundance from many districts this year.

It is to be hoped that the growing attention which is being given to these smaller fungi may lead to a better acquaintance with the causes inducing their sudden appearance and rapid development. When these causes are known, one may obtain the power of modifying or controlling, if not of totally preventing, their ravages.

Ergot has been observed on a large number of our native and cultivated grasses as well as on our cereal crops. The grasses that are most subject to its attacks are Rye-grass (*Lolium perenne*, Linn.); the Brome-grasses (*Bromus secalinus*, Linn., *B. mollis*,

Linn., *B. pratensis*, Ehr.); Couch-grass (*Triticum repens*, Linn.); Fox-tail-grass (*Alopecurus pratensis*, Linn.); Timothy-grass (*Phleum pratense*, Linn.); Fescue-grass (*Festuca elatior*, Linn.); Barley-grass (*Hordeum murinum*, Linn.); and Manna-grass (*Glyceria fluitans*, R. Br.). With the view of enabling the reader to recognise this pest, which is made too little account of by agriculturists I have given a number of engravings from remarkably accurate but till now unpublished drawings of its appearance on different plants, made by Francis Bauer, who for several years carefully observed this disease, when he was connected with the Royal Gardens at Kew as botanical draughtsman.

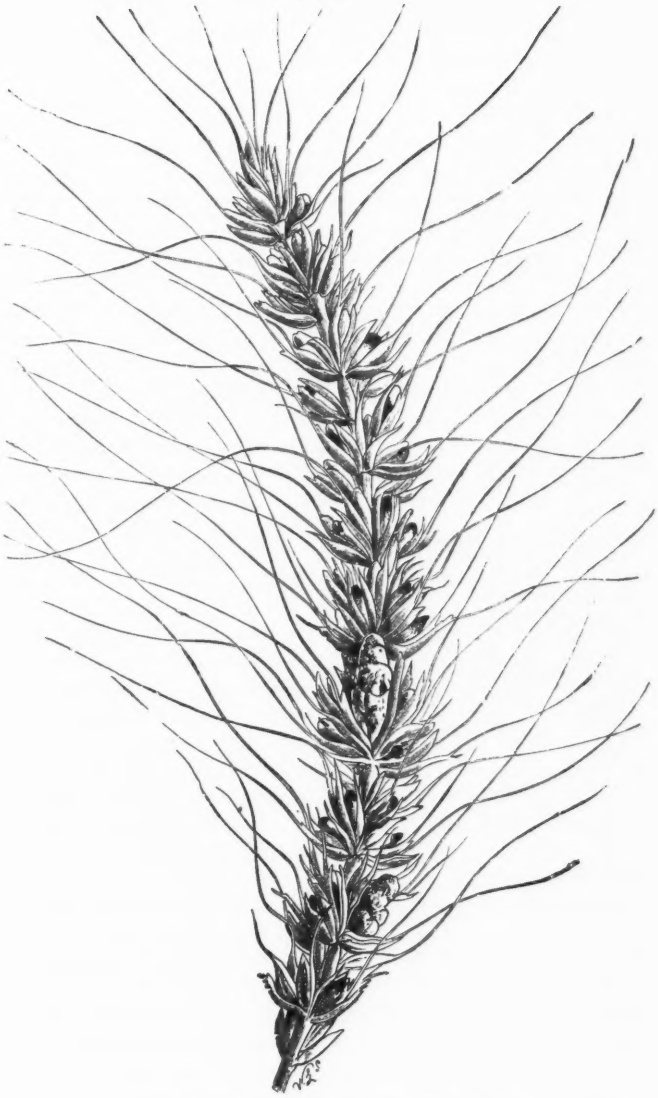
Fig. 193. Fig. 194.

Rye, *Secale cereale*, Linn. Two spikes bearing several Ergots.

As we are most familiar with the appearance of ergot on the cereals, I shall first notice the grain plants affected by it.

That on which it is best known, and from which it is chiefly collected for use in medical practice is Rye (*Secale cereale*, Linn.). In Fig. 193 is shown a spike of rye, with only a single ear affected by a short and thick ergot; but in Fig. 194 several ears are ergotted, and the larger and more slender forms of the majority of the diseased ears exhibit their usual aspect. The great increase in the size of the grain, shown in the drawings, suggested

Fig. 195.



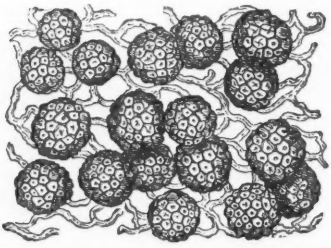
Spike of Spring Wheat affected with Bunt and Ergot. (453)

to Bauhin the name (*Secale luxurians*) he gave to ergot, more than 250 years ago in one of the first published notices of the disease.

In barley and wheat ergot is not so frequently met with as in rye; nevertheless, when carefully sought for, it will often be found. It has been observed in all the cultivated varieties of wheat. Fig. 195 (p. 453) represents a remarkable case of diseased spring wheat, observed by Bauer. Two of the ears only are ergotted, while the great majority are affected by another and better known disease, bunt or pepperbrand, due also to a minute parasitic fungus (*Tilletia caries*, Tul.).

Bauer made a series of experiments with the view of discovering the manner in which different diseases due to microscopic fungi might be communicated to wheat and other cereals. He placed a quantity of the powder (spores) of bunt on the seed of spring wheat, which he then sowed. As the wheat ripened it became extensively affected with the bunt disease. In bunt the contents of the grains are generally completely replaced by a uniform black powder; the grain is brittle and easily crushed between the fingers, when it has a greasy feeling and gives off an offensive fetid smell. Under the microscope this black powder is seen to be composed of spherical spores with a reticulated surface (Fig. 196). If a diseased grain is examined before the spores are fully ripe, they will be seen to be attached by short stalks to a fine branched thread or mycelium, which appears to be absorbed as the spores ripen; it can scarcely be detected in the fully ripe bunt.

Fig. 196.



Spores of Bunt showing the threads of Mycelium. Very highly magnified.

Besides the bunt, ergot also appeared in Bauer's small experimental crop of spring wheat, and in the head figured (Fig. 195, p. 453) he observed that the same grain was attacked by both fungi, as was noticed subsequently by Phillipi and others, and has been illustrated and described by Tulasne. A spikelet from the centre of this head is represented double the size of nature in Fig. 197 (p. 455). This consists of three grains, all diseased. That in the centre is the largest, the great size being due to the growth of

the ergot below the grain itself, which is entirely converted into bunt-spores, and is carried on the apex of the growing ergot and surmounted by the withered remains of the style. This is clearly seen in the section of this grain (Fig. 198), in which the dark colour of the bunt-spores at the apex is contrasted with the lighter-coloured internal structure of the ergot below. The lateral grains of the spikelet are about the size of ordinary wheat-grains, only,

Fig. 197.

Spikelet from the head of Spring Wheat affected with Ergot and Bunt. Twice the natural size.

Fig. 198.

Section of the terminal Grain of the Spikelet.

Fig. 199.

a *b* *c*

The lateral grains of the Spikelet. *a* and *b* in section; *c* showing the external appearance. Twice the natural size.

like all bunted grains, they are somewhat shorter and blunter. One of these (Fig. 199, *a*) is entirely converted into bunt-spores, while the other (*b* and *c*), like the central grain, has an ergot established in the lower portion, though still young and very small.

It deserves to be noticed that in both the ergotted grains of this spikelet the early sphacelia state of the ergot is carried up

beyond the ergot itself, and covers the bunted apex of the grains as well.

Maize is subject to the attack of ergot.

The appearance of ergot in rye-grass is well known. Improved husbandry has made this a comparatively rare grass in cultivated fields, where it is of little value as a forage plant, though not so injurious as it has been called; indeed recent experiments make it almost certain that the evils reported and believed to have been produced by the use of darnel have been really caused by the unobserved ergot. The frequency with which rye-grass is attacked has often been noticed. Edward Carroll says he never failed to discover it more or less ergotted in fields allowed to stand for seed, and he adds, what appears to be opposed to general experience, that its extent is in proportion to the wet or dry state of the summer months during its maturation; being rarer when wet, frequent when dry. The probable explanation of this reversing of the experience in England and the Continent is, that it is due to the normal moist atmosphere of Ireland, where Mr. Carroll made his observations, being fitted for the germination of the spores of fungi; while rain would wash the spores off the plants, and a superabundance of water would be unfavourable to their growth.

A head of Timothy-grass (*Phleum pratense*, Linn.) is represented in Fig. 200 (p. 457) with an extraordinary number of ergotted ears. This grass forms a considerable portion of the late meadow crops in many districts.

I have already in the darnel figured the ergot in a weed in cultivated grounds; and in the barley-grass (*Hordeum murinum*, Linn.), Fig. 201 (p. 457), we have it on one of the most common annual grass-weeds of our road-sides and waste places. Although this is a worthless weed, as it is rejected even by the half-starved animals that feed by the road-side, it may be actively injurious to the agriculturist if it is to any extent a nidus for the growth of ergot.

Numerous other illustrations might be given, but our figures of the ergot, as it appears in cereals and in pasture and weed grasses, are sufficient to show the general aspect of this parasitic fungus, and to enable the reader easily to detect it.

No farm or district has any right to hope for exemption from this dangerous pest. It may not have been noticed, or it may have actually been absent for many years, yet it may suddenly,

without any obvious cause, appear in great abundance and prove a cause of serious destruction to the cattle or sheep placed in the field where its presence is not suspected. The late Mr. John Curtis, a keen and learned entomologist, who had an accurate

Fig. 200.

Timothy Grass. *Phleum pratense*, Linn.

Fig. 201.

Barley Grass. *Hordeum murinum*, Linn.

knowledge of the British grasses and a quick eye for natural objects, had for thirty years beaten the ground between Southwold and Kessington, on the coast of Suffolk, for insects, and had never noticed any specimens of ergot till the year 1847, when he found it

on the spikes of *Arundo arenaria*, Linn., in such abundance that he estimated that one-sixth, if not one-fourth, of all the ears of this grass in the district were diseased! ('Gard. Chron.,' 1847, p. 653.)

Fig. 202.

Spikelet of Rye with Ergot. Natural size.

Fig. 203.

Fine Ergot on a foreign species of Lyme Grass, *Elymus giganteus*, Vahl. Natural size.

The different drawings have shown that the ergot bears a certain relation to the seed of the plant in which it occurs, but that in all it attains a larger size than the normal grain, and is especially longer and more horn-like. It occupies the place of the seed, but, unlike most of the parasitic fungi with which agriculturists are acquainted, it sends no roots down into the plant, its whole organisation being confined to the affected ear. The external surface is scaly or somewhat granular, and is generally marked by longitudinal and horizontal cracks, penetrating into and exposing the interior. The colour is black or purple-black, but the interior is white or purplish, and of a dense homogeneous structure (Fig. 204, p. 459), composed of spherical or polygonal cells, so largely charged with an oily fluid[1] as to burn freely when lighted at a candle.[2]

[1] The oil is of a brownish yellow colour, of aromatic flavour and acrid taste; it is viscid, and its specific gravity is ·9249. It consists of 69 per cent. of oleic acid, 22 of palmitic acid, and 8 of glycerine, with traces of acetic and butyric acid, and trimethylamin, ammonia and ergotine as colouring matter.—Dr. Herrmann.

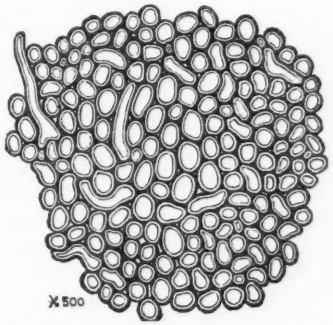
[2] The inorganic constituents of ergot are—

Potash	30·06
Soda	0·65
Lime	1·38
Magnesia	4·87
Alumina	0·58
Oxide of iron	0·86
Oxide of manganese	0·26
Phosphoric acid	45·12
Silica	14·67
Chloride of sodium	1·50
	99·95

Dr. Herrmann in Buchner's 'Repertorium for 1871,' p. 283, and 'Pharmaceutica Journal,' 1872, p. 241.

De Candolle suggested that this anomalous structure had some affinity to the amorphous indurated masses of mycelium which had been united together in a spurious genus to which was given the name *Sclerotium*. The illustrious mycologist Fries separated it from *Sclerotium*, and established a genus for its reception, which he designated *Spermoedium*, although he doubted whether it should be included among the fungi at all, considering it rather as only a morbid condition of the seeds of grasses.

Fig. 204.



Microscopic structure of Ergot, magnified 500 diameters.

The true nature of ergot was at length determined by observations first made on its early history and development on the diseased plants, and then by experiments on the ergot itself, with the view of determining its ultimate product. In both directions the most satisfactory results have been arrived at, and we now know the complete history of the plant.

In its earliest condition this parasitic fungus escapes notice, being composed of a large number of very small elongated cells borne in a colourless liquid. In about three days after the plant is attacked the ergot becomes visible, appearing as a yellowish viscous substance resting on the outer coating of the as yet undeveloped attacked grain (Fig. 205, p. 460). It exudes from between the glumes and more or less completely covers the whole seed. It has a taste like honey and an odour like that of grated bones. The ears naturally attacked do not belong to less vigorous or healthy plants than those that escape.

Once established, the fungus rapidly developes, carrying upwards the aborted remains of the seed, crowned with the withered styles, and forming below the homogeneous sclerotioid mass, which becomes the true ergot. The state of the development of the ergot had been observed early in the century by Bauer, though none of his figures were published till 1841. He had noticed its relation to the outer covering of the seed, and had supposed it to

be an altered condition of that structure ('Linn. Trans.,' vol. xviii, p. 475).

Léveillé, in 1826, noticed that the ergot commenced with this soft covering, and considering it to be a distinct fungus, parasitic on the ergot, he proposed for it the name of *Sphacelia*. John Smith and Quekett, in 1841, published descriptions of the structure of this sphacelia condition, as far as they were able to observe it. They thought it was an amorphous mass of small spherical cells, with a number of larger doubly-nucleated oblong cells scattered among them. It was supposed to be the immediate cause of the ergot, and Quekett gave to it the name of *Ergotœtia abortifaciens*, while Berkeley and Broome, believing it to be a true *Oidium*, removed it to that genus under the name *O. abortifaciens*. Bauer's drawings are singularly accurate representations of the general aspect of the disease in its different stages, and while his microscope disclosed to him in 1805 all that Quekett published in 1841, it was not sufficient to exhibit the minute structure as it has been recently described and figured by Tulasne. In Bauer's drawings (Fig. 206, p. 461) the sphacelia is represented as consisting of tortuous and anastomosing ridges or plates, with numerous open cavities in the interior. Tulasne showed that the sphacelia was organically connected with the ergot, and was, indeed, only a condition of it.

Fig. 205.

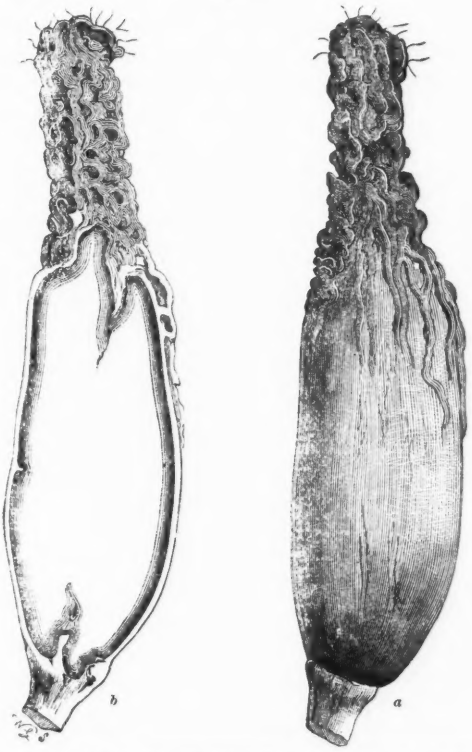
A Grain of Rye covered with early, or sphacelia, state of Ergot. Twice the natural size.

Bauer detected the elongated nucleated cells of the sphacelia, but, like Quekett, he did not observe their connection with the supporting structures; while the cavities accurately represented by Bauer in the foldings of the sphacelia (Fig. 206) are the free spaces where the nucleated cells or "spores" are produced.

The illustration (Fig. 207, p. 462), copied from Tulasne, shows the relation of the different structures. The dark lower portions of the woodcut is a section through the growing sclerotium or ergot, properly so called. This is composed, as we have already seen, of densely-packed polygonal cells, filled with oil globules. On its outer surface and from its apex are given off elongated

cells, which are the supports (sterigmata) of oblong cells (spermatia or conidia), the most of which are free in the drawing. These cells are the spores of the *Ergotœtia* of Quekett, and the *Oidium* of Berkeley and Broome. The oblong cells or "spores,"

Fig. 206.



Ergotted ear of Rye, showing the early sphacelia state at the apex, and the young Ergot at the base. *a*, external appearance; *b*, section. Magnified six times.

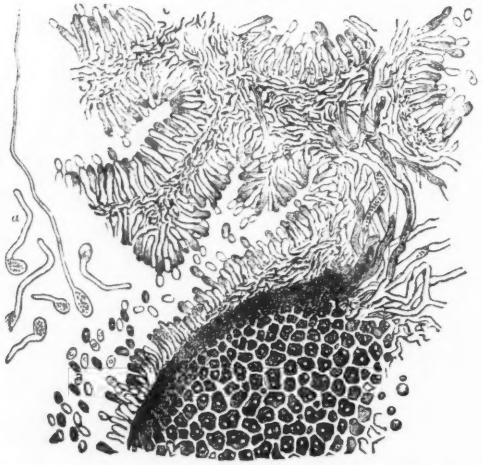
when placed in water, freely germinate (Fig. 207, *a*), and they have the power of reproducing the parasite. But we have not here the perfect condition of the plant. Recent observations have shown that many fungi produce at different stages of their history free cells possessed with the power of germination. The sper-

matia-bearing stage has been observed in other fungi besides the ergot.

When the ergot attains its full size the sphacelia disappears, or only the withered and dried up remains of it can be detected at the apex of the ergot.

The further history of the ergot has been determined also by Tulasne. The frequent occurrence of minute sphærias on the ergotted grains of grasses suggested to him that they were probably not accidental productions, as had been supposed, but were

Fig. 207.

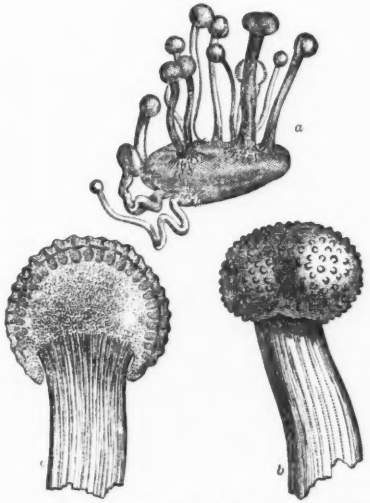


Magnified section of an Ergot covered with the Sphacelia; *a*, spermatia germinating in water. (From Tulasne.)

organically connected with the ergot, and represented a further stage of its development. With the view of testing this opinion, he planted a number of ergotted grains, and had the satisfaction to find that a considerable proportion produced sphærias. Those produced by the ergot of rye were the same in form and structure with what were grown from the ergots of most of the other grasses, and believing them all to belong to the same species, he gave to it the name of *Claviceps purpurea* (Fig. 208, p. 463). This perfect plant is a small purplish fungus, with a spherical head, supported on a short firm stem, with a somewhat downy base. The

globose head is rough with small prominences, which are the openings of the cavities or conceptacles in which the spores are produced (Fig. 208, *b* and *c*). One of these conceptacles, highly magnified, is shown in Fig. 209, *a* (p. 464) representing the oval cavity filled with the long slender spore cases (asci) springing from the base of the cavity. The mouth of the conceptacle opening through the conical swelling is obvious; this gives the granular aspect to the head of the fungus. Four of the sacs or asci are represented at *b*, still more magnified. They are seen to be filled

Fig. 208.



a, Ergot of Wheat producing the small Fungus, *Claviceps purpurea*, Tul.; *b*, one of the heads magnified. *c*, section through a head, to show the cavities containing the spores. (From Tulasne.)

with slender needle-shaped bodies, which are the ultimate and perfect reproductive spores of the ergot. A few of these spores are represented still more magnified at *c*.

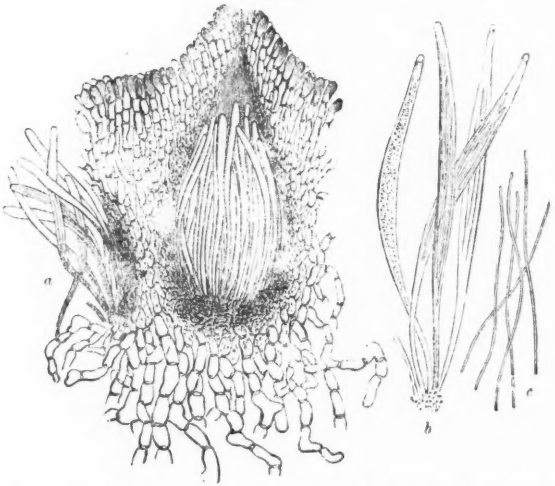
Having traced the history of the ergot, we may now inquire how and at what time the crops get infected, with the view of seeing whether it is possible to discover any means of alleviating, if not of destroying, this injurious parasite.

At two different stages in the life of ergot, bodies are produced which have the power of propagating the disease, namely, the

spores of the perfect fungus developed from the ergot, or the "spores" (spermatia or conidia) of the early sphacelia state of the parasite.

The plant is carried over the winter in the dormant ergot condition. A large proportion of the ergot in a field, when it is fully ripe, falls to the ground during the operations of the harvest, or by the friction of the spikes against each other through the action of the wind. These ergots remain on the ground during the winter without undergoing any change. They are dormant, like the

Fig. 209.



a, magnified section of a conceptacle, showing the slender spore-cases, and the tumid mouth of the cavity; *b*, spore-cases magnified; *c*, single spores. (From Tulasne.)

seeds of plants, until the following spring or summer, when they produce crops of the perfect fungus (*Claviceps purpurea*, Tul.). The spores of the *Claviceps* are ripe about the time that the cereals come into flower, and by the action of wind or rain they obtain access to the flowers.

In 1856 Durieu communicated ergot to rye by placing the spores of the *Claviceps* on its flowers. Roze has since confirmed and extended these observations ('Bulletin Soc. Bot. de France,' 1870).

It is, then, by these minute needle-like spores that the disease is communicated at first to all crops; and the principal effort of

the farmer who desires to free himself from this pest should be to secure clean seed, perfectly free from ergot. The ergot is too frequently overlooked in the barn from its resemblance to the dung of mice; but it is worth special pains in examining the seed to secure immunity from this parasite. Tulasne states as the result of his experiments that if the ergot does not produce the *Claviceps* during the first year after it has fallen to the ground, it loses its vital powers. One might hope to find in this observation of Tulasne the means of coping with the disease; and certainly it is most desirable not to follow an ergotted crop with another crop of cereals. But it must be remembered that the same species of fungus produces an ergot in most of our grasses, and that the spores belonging to the *Claviceps* of these grass ergots will as readily communicate the disease to cereals as those produced by the cereals themselves. We may, therefore, have in ergotted grasses growing in the margins of fields or along hedge-banks the means of maintaining and spreading the disease in cereal crops. No trouble should be spared to collect and destroy the ergots on such grasses. To permit them to fall to the ground is a certain method of securing the appearance of the disease on any cereal or grass crops in the neighbourhood in the following year.

But the disease having once appeared in a field of growing grain, or amongst hay or grass, easily spreads itself in its early sphacelia state. Every one of the "spores" (spermatia) has the power, as we have seen, of germinating, and so spreading the disease. The striking of an ergotted head against a healthy plant will communicate the disease. This has been experimentally tested by Bonarden, and confirmed by Roze. It is not possible, however, to interpose at this stage of the malady with the view of arresting it. The diseased grains are difficult to discover in the field, and it would be hopeless to attempt to pick them out. The disease can only be effectually dealt with while the plant is in its dormant state as an ergot, as already pointed out.

REVIEWS AND BOOK NOTICES.

DR. COUES'S BIRDS OF THE NORTHWEST.[1] — This volume of eight hundred pages forms "No. 3" of the "Miscellaneous Publications" of the United States Geological Survey of the Territories, F. V. Hayden, U. S. Geologist in Charge. As its title indicates, it is intended as a Hand-book of the whole region drained by the Missouri and its tributaries. It thus embraces a large area in the interior of the continent, including the whole of Nebraska, the greater portions of Dakota, Montana, Wyoming, Colorado, Kansas and Missouri, with portions also of Iowa and Minnesota. This region embraces the greater part of the so-called Middle Faunal Province of North America, but overlaps also the eastern edge of the Western Province and the western edge of the Eastern Province. It hence includes the greater part of the birds of the continent, embracing nearly all of those of the Eastern Province as well as those of the Middle Province. Most of this extended region is embraced within the great elevated central plateau of the continent, where the annual rain-fall is low; owing to this fact, the vegetation is meagre and stunted, and the country generally treeless. As the author says, "Trees are in effect restricted to the mountainous tracts, and to a slender, precarious fringe along most of the larger streams." This precarious fringe, however, is sufficient to entice the eastern tree-nesting species far up into the interior of this vast sterile plain, curiously blending the faunas of the Eastern and Middle Provinces by a series of interdigitations.

The topics specially treated in this work, among the most prominent of which is the geographical distribution of the species, receive that thorough attention which is so well known to mark all the work that Dr. Coues undertakes. Their distribution is given not only with definiteness for the special region under consideration, but also for the whole range of each of the species treated. Their areas of residence and range of migration, together with their relative abundance or scarcity, over different

[1] Birds of the Northwest: A Hand-book of the Ornithology of the Region drained by the Missouri River and its Tributaries. By Elliot Coues, Captain and Assistant Surgeon U. S. Army. Washington: Government Printing Office. 1874. 8vo. pp. xi, 791.

parts of their respective habitats, are given with a degree of detail never before attempted for the birds of this country, if ever before for any country. The synonymy is also uniformly worked out with greater detail than ever before, while the number of bibliographical references given for each species far exceeds the number heretofore given in any work on American ornithology. While not only all references of any importance are generally given (we observe here and there a few rather noteworthy omissions) the nature of the special papers cited is usually indicated, and the authorities for the special facts of distribution are stated, thereby adding greatly to the value of the bibliographical portion of the work.

A redescription of the species was deemed unnecessary, since, in view of the several excellent descriptive works that are now so generally accessible, it seemed needless to swell the size of the work by a repetition of such descriptions. The matter of the volume is hence almost entirely new, the biographical portion, as the writer says, being based mainly upon his own personal observations. He has, however, not only made use of numerous manuscript notes given him for his work by several of his fellow ornithologists, but has collected and combined in a most satisfactory manner the recent contributions of other authors, published in detached papers in different and not generally accessible scientific journals. Dr. Coues's aim being to contribute new material for future elaboration, rather than to prepare complete histories of each species described, which, however desirable, was, under the circumstances, wholly impracticable, he has devoted generally but a few lines to the well-known species of Eastern birds, while he has been able to furnish very nearly complete biographies of some of the heretofore slightly known Western species. The volume ends with monographs of several families of the water birds—*Laridæ*, *Colymbidæ* and *Podicipidæ*—to which, as is well-known, Dr. Coues has for a long time given special attention. These are worthy of an extended critical notice, which want of space will not at this time permit.

A thorough and detailed index of more than fifty three-column pages fitly closes the volume, crowning a work that will ever remain a monument to its indefatigable author, and a source of profit and pleasure to future workers in the same field. The amount of drudgery represented in these pages, which sooner or later some one must have done, places ornithologists particulary

under obligations to the author, while his easy-flowing, graceful and sprightly pages of biographical matter, glowing with the enthusiasm of the naturalist, and evincing the inspiration of actual contact in their natural haunts with the objects described, will render his book a pleasing and attractive one to the general reader.

But the author is not alone entitled to our thanks or our congratulations. It must not be forgotten that Dr. Hayden's early explorations in the Upper Missouri region, together with the later collections made under his direction as Geologist in charge of the Geological Survey of the Territories, have furnished both the basis and the occasion for the present report, and that to his wise liberality we are indebted for its publication.—J. A. A.

BOTANY.

BOTRYCHIUM SIMPLEX, WITH PINNATED DIVISIONS TO THE STERILE FROND.— In 1873, Mr. E. W. Munday sent, from Syracuse, New York, a large specimen of *Botrychium simplex*, having four pairs of broadly wedge-shaped divisions to the sterile part of the frond, these merely incised at the broad terminal margin. From Syracuse, Mrs. Styles M. Rust now sends a very robust specimen, apparently of the same species, but of a different aspect, the divisions of the sterile part of the frond being more approximate, narrowly oblong in shape, and strongly pinnatifid. The texture is that of *B. simplex*, *i.e.*, thick and rather fleshy. This may interest our fern-students and collectors. The variety may take the name of var. *bipinnatifidum*.—A. GRAY.

FUCAS SERRATUS.— Colonel Pike has personally assured me that this Fucus was abundant at Newburyport when he was there in 1852. Rev. J. Fowler sent me some from Pictou harbor in 1869, and again lately in large quantity, the plant several feet long, and fruiting abundantly. He writes that he collected it Nov. 1, 1874, and that "it seemed abundant on the rocks round the harbor, and had every appearance of being a native."— DANIEL C. EATON.

MENYANTHES TRIFOLIATA, the *Buck-bean*, has dimorphous flowers, according to the observations of C. A. Wheeler, of Hubbardston, Michigan, who also calls attention to the fact that Kuhn, in Germany (in "Botanische Zeitung," 1867), includes this in a list of dimorphic genera. It had escaped our attention.—A. G.

ZOOLOGY.

DESCRIPTION OF A NEW WREN FROM EASTERN FLORIDA.—*Thryothorus Ludovicianus* (Lath.), var. *Miamensis*, Ridgw. Florida Wren. *Diagnosis.*— Similis *T. ludoviciano*, sed major, robustior, et coloribus saturatioribus. Alæ, 2·75; cauda, 2·60; culmen, ·90; tarsus, ·95; dig. med. (sine ungue), ·60.

Hab. in Florida orientale (Miami River, Jan., 1874, C. J. Maynard). Typus No. 1864, Mus. R. R.

Similar to *T. Ludovicianus* (Lath.), but larger, stouter, and more deeply colored. Above rusty-chestnut, most castaneous on the back, and becoming browner on the forehead. Wings and tail with indistinct, narrow, dusky bars, and rump with concealed white spots; a wide post-ocular stripe of dark rusty on the upper half of the auriculars, running back into the rusty of the nape. Below deep rusty ochraceous, the sides and flanks showing indistinct bars of darker rusty; chin and crissum soiled whitish, the latter banded with dusky black; a continuous superciliary stripe of pale ochraceous, bordered above by a blackish line along each side of the pileum; cheeks grayish soiled white, with faint crescentic bars of dusky. Bill dusky, the superior tomium and lower mandible pale (lilaceous in life?); feet pale horn color. Wing, 2·75; tail, 2·60; culmen, ·90; tarsus, ·95: middle toe (without the claw), ·60.

Habitat.—Miami River, eastern Florida (January 9, 1874; C. J. Maynard). Type No. 1864, Mus. R. R.

REMARKS.—In coloration, this strongly-marked form closely resembles *T. Berlandieri* Baird of the lower Rio Grande (see Hist. N. Am. B., I, p. 144, pl. ix, fig. 2), but the size is greatly larger than even the most northern examples of *Ludovicianus* proper, while *Berlandieri* is smaller. It is very remarkable that the southern form of this bird should be so much larger than the northern one, in direct opposition to a recognized law of climatic variation, but we have another case of this same exception to the rule in *Catherpes Mexicanus* (Swains.), and its northern race, var. *conspersus* Ridgw. (see Hist. N. Am. B., I, pp. 138–140, and III, 503); these examples probably justifying the suggestion made by the writer (*op. cit.*, iii, 503), that an exception to the rule of de-

crease in size to the southward, in resident species, may be made in case of families or groups of families which have in temperate latitudes only outlying genera or species, the increase in this case being to the southward, or towards the region in which the family or group is most highly developed!—ROBERT RIDGWAY.

THE FRIGATE BIRD AND WHITE IBIS IN CONNECTICUT.— The occurrence of *Tachypetes aquilus* in Connecticut is not generally known, Long Island being, up to this time, the northernmost locality on record for this bird. A female of this species was killed at Faulkner's Island in this state in the autumn of 1859, and is now in the collection of Capt. Brooks. It was hovering over the island when shot. Late in the afternoon of May 23, I observed near Milford, Conn., a specimen of *Ibis alba*. I recognized the bird as it flew over me, and following it to a small pond where it went down, discovered it perched upon a tree over the water. I carefully examined it with a good glass, at a distance of about one hundred and fifty yards, and by this means was enabled to note every detail of form and color. It was in full plumage, the white being pure, and the naked skin about the head, bright red. After watching it for a few moments I tried to approach it, but before I came within gunshot it flew, uttering a hoarse cackle as it went off.—GEO. BIRD GRINNELL, *New Haven, Connecticut.*

NEW BIRDS IN KANSAS.—The following additions to the Kansas list have recently been made: *Micropalama himantopus*, near Lawrence, Sept. 9th and 19th, 1874, by W. Osburn; *Calidris arenaria*, same locality, Oct. 7th, 1874, by W. E. Stevens; *Ægiothus linaria*, at Baldwin, fourteen miles from Lawrence, March 13th, 1875, by John Holzapfel, also seen in Western Kansas in November, by Mr. Trippe, as recorded in Dr. Coues' "Birds of the Northwest;" *Dendroeca palmarum*, at Topeka, May 6th, 1875, by E. A. Popenol. To these should be added *Ampelis garrulus*, a specimen of which taken at Fort Riley, by Dr. Hammond, is in the Smithsonian collection. The Kansas List now contains 292 species.— F. H. SNOW, *Lawrence, Kansas.*

NEMATOIDS IN PLANTS.—Greef found (SB. Ges. Marburg, 1872) certain tubercles on the root-fibres of *Dodaxia orientalis* full of Anguillulæ in all stages, from the egg to the mature and preg-

nant state (these had previously been found in similar galls on the root-fibres of *Sedum* and grasses). On Anguillulæ of *Tylenchus Rivinii* compare Frauenfeld, Verh., Z.-B., Ges. Wien, xxii, p. 396. — *Zoological Record for* 1872.

GEOLOGY AND PALEONTOLOGY.

The Disintegration of Rocks and its Geological Significance.[1]—This subject the speaker had briefly noticed in a communication to the Association in 1873, on the geology of the Blue Ridge. The change of the rocks in question is a chemical one, which is most obvious in the case of crystalline rocks; the feldspar loses its alkalies and part of its silica, being changed into clay, and the hornblende its lime and magnesia, retaining its iron as peroxide. From this results a softening and decay of the rocks to greater or less depths, so that while the beds still retain their arrangement, and are seen to be traversed by veins of quartz and of metallic ores, they are often so much changed to depths of a hundred feet or more as to be readily removed by the action of water. This phenomenon is well seen in the crystalline rocks of the Blue Ridge, and not less remarkably in those of Brazil, where it has been noticed by many observers, among the latest of which is Professor Hartt. Darwin, who long ago described it, imagined the change to have been effected beneath the sea, but according to the speaker it has been a sub-aërial process, which has been at work during past ages, when the composition of the atmosphere and the climatic conditions differed from those of to-day, and when carbonic acid, aided by warmth and moisture, abounded. He connected it with that slow purification of the atmosphere which, from very early times, has been going on. The alkalies and lime and magnesia, set free in this process, absorbed the atmospheric carbonic acid, and the carbonates carried down to the sea in a dissolved state gave rise to limestones, dolomites, and common salt. Such a process of decay was already active at an early period, and, from facts observed in Missouri by Pumpelly, had affected the iron-bearing feldspar-porphyries at the commencement of palæozoic time. It was, according to the speaker, from the washing down of the thus decomposed crystalline rocks that all the clays and sands which had gone to build up the sediments

[1] Abstract of a paper read before the American Association for the Advancement of Science, at the Hartford Meeting, August, 1874.

of our vast beds of palæozoic and more recent rocks had been either directly or indirectly derived. This had already been pointed out by Lyell for the tertiaries of the southern states. He thought it probable that the process of decay had gone on with decreasing energy to our times, though it is now insignificant in its action, owing to changed atmospheric conditions.

The speaker drew a picture of North America in past geological ages. The frequently taught notion of the growth of our continent southward and outward from a nucleus in the vicinity of the great lakes has no foundation in fact, and the study of the uncrystalline sedimentary formations tells a different story. The great palæozoic basin was to the east and west, as well as the north, surrounded by areas of decaying crystalline rocks. Those of New England, of the Blue Ridge, and of the crystalline area to the east of it are the remains of a great disintegrated and wasted continent, whose ruins have built up the uncrystalline rocks to the westward of it, as well as the sediments along the eastern and southern borders of the United States. Up to a comparatively recent period, the hills of New England, eastern New York and New Jersey, were probably, like those farther southward along the Blue Ridge, deeply covered by the products of their own decay, and from these were derived the clays, as well as the brown iron ores which are found along the base of the Blue Ridge and its northeastern continuation.

It was during the glacial period, which the speaker considered to have been one of submergence and subsequent gradual uplift of northeastern America, at which time it was exposed to the action of local glaciers and to the iceberg-drift of the polar current, that the final removal of this decayed covering from our hills had taken place, while farther southward the mountains beyond the reach of this denuding action still retained to-day their covering of decayed rock. A similar condition of things is to be seen in northwestern Minnesota, where, according to White, the decayed crystallines have escaped denudation. The process of decay in the more massive and granite-like rocks had often been incomplete, and working from natural joints had left unchanged nuclei of hard rock which, when erosion took place, remained as rounded masses or bowlders; a point which has been well brought out by Mr. Burbank from his studies in North Carolina, and throws much light on our northern drift-deposits.

A profound decay had also affected the hard palæozoic limestones, from which the carbonate of lime had been dissolved, leaving a porous, rotten rock behind. This, as Dawson has shown, is well seen in the impure argillaceous Trenton limestone near Montreal, which, in localities protected by trappean dikes from the eroding action which came from the northeast, is found deeply decayed, while elsewhere, near by, its hard surface is worn down and glaciated. Examples of a similar local exemption of the decayed crystalline rocks from erosion are not wanting in New England.[1]

The speaker alluded, in closing, to a process of mechanical disintegration, without chemical change, which in past ages had broken up undecayed crystalline rocks to form breccias and conglomerates. These are seen locally, from the ancient porphyry-conglomerates of the Lake Superior copper-mines to very recent deposits, and a remarkable example is met with in the beds of granitic material, which, in a recemented state, make up parts of the red sandstone of the Connecticut valley. The slow breaking up of many crystalline rocks by the action of frost had been suggested by Dawson as a potent agent in the production of such material, and the speaker conceived that this, in the present state of our knowledge, was the most probable explanation of its origin.—T. Sterry Hunt.

ANTHROPOLOGY.

Artificial Perforation of the Cranium.—I wish to call attention to what seems to me to betoken a singular practice connected with the burial ceremonies of the aboriginal inhabitants of this country, and of which I can find nothing on record in the books, notwithstanding the remarkable nature of the custom, and the indubitable marks which would remain to testify in instances where it had been adhered to. I have reference to the artificial perforation of the top of the head after death.

The circular aperture, evidently made by boring with a rude, probably stone, implement, varies in size, in some instances having

[1] An example of this is seen in Kent in Connecticut, and also in North Adams, Massachusetts, where the tunnel lately made through the Hoosac Mountain shows that the gneiss rock at its western base is completely decomposed to a depth of 200 feet or more; while on the summit of the mountain are seen worn and glaciated surfaces of the same rock in an undecomposed state.

a diameter of one-third, in others one-half of an inch, and flaring at the surface. It is invariably placed in a central position at the top of the skull.

The first instance of its being brought to my knowledge was in the year 1869, when I took from the Great Mound on the River Rouge, Michigan, two fragments of crania, each of which exhibited this perforation. A skull recently presented to the museum of the Detroit Scientific Association by Mr. A. C. Davis, and which was exhumed from a mound on the Sâble River, Lake Huron, Michigan, also has this mark. From ten to fifteen skulls were taken from the same mound, all being similarly perforated, and there being, as I am informed, no other remains interred with them. During last Summer (1874), in some further excavations made in the Great Mound at the River Rouge, among other relics exhumed were eight crania, two of which had this aperture. Of the remaining bones of the bodies pertaining to the two skulls in question, I specially noticed that many were wanting, and that those present were heaped *en masse*, and not in the usual manner of burial, seeming to imply that they were interred subsequently to being denuded of the flesh and the other soft parts of the body.

Besides the foregoing instances of this curious custom which have been brought to my immediate knowledge, I have since been informed of the finding of a skull at Saginaw, Michigan, which presented the peculiarity; but in this case there were three perforations arranged cocoanut fashion.

All enquiry which I have made of learned societies or individuals in regard to this observance has elicited an utter disclaiming of all knowledge on the subject. The two largest collections in Ethnology in this country, the Smithsonian Institution and the Peabody Museum, contain no evidence of it. Prof. Joseph Henry, in replying to my queries, stated that the only information he had procured in relation to perforated skulls was the following from Prof. Mason of Columbian College: "It is an interesting coincidence that the head-hunting Dyaks of Borneo have a house in the centre of their village, in an upper story of which they keep the heads which they capture suspended by a string which passes through a perforation in the top of the skull." The late lamented Prof. Wyman, in a letter written me the day before his death, emphatically states that the fact of this perforation was new to him; adding: "There is nothing of the kind in any of the skulls in our

museum, nor have I seen it mentioned as existing elsewhere." A friend has learned for me that an educated Indian makes the statement, in reply to our enquiry, that he remembers hearing his father say that formerly the heads of distinguished men and chiefs were honored by this mark after death.

The skull from the Sâble River is of a dark color, and its latitudinal or cephalic index, .770, would place it within the Orthocephalic or medium range; the altitudinal index being inferior, or exactly .745. The foramen magnum (contrary to the cranium of the North American Indian) has a central position, its index being .501. The two perfect specimens from the Rouge River are decidedly Brachycephalic, the cephalic indices being respectively .822 and .853, the altitudinal indices being inferior, or respectively .733 and .828, while the indices of the foramen magnum are, in one case .441, and in the other .507.

It is to be hoped that in thus calling attention to this singular custom, further information will be elicited; and I take this opportunity of earnestly soliciting the communication of any facts bearing on the subject, which I shall thankfully receive and duly acknowledge.

Since sending the foregoing to the NATURALIST, my attention has been called to a note in Harpers' Magazine for May, 1875, issued since my remarks were written, which states that "a communication made by Dr. Prunières (de Marvejols) before the meeting of the French Association for the Advancement of Science, at Lille, treated of the curious artificial perforations common among the neolithic skulls of the Lozère. These perforations vary, in the pieces exhibited, from an inch to an inch and a quarter in diameter. Near the perforated skulls were found rings of cranial bone, which seemed to be designed as amulets. These were evidently worked with flint tools. The men of the polished stone age practised trepanning; for if some of the skulls appear to have been perforated after death, others were treated during life, and the patients had lived for years afterward. One skull presented three perforations made near each other upon a line fore and aft. There is no distinction of age, the excisions occurring upon infants as well as upon adults. The motive of this strange custom was either medical or superstitious. They probably attributed disease to supernatural agencies. The evil spirit escaping through the opening made by the sorcerer, who wrapped the

operation in a shroud of mystery by preserving the detached piece as a precious relic. From the appearance of these facts reported by the learned archæologist of Lozère, he said that a new light had been shed upon the intellectual state of man in the polished stone age. It explained his religious conceptions, and confirmed the discovery of the figure of a goddess in the caverns of Baye (Marne). M. Broca remarked that perforated skulls were also found at the last named station. Among the skulls dug up by General Faidherbe were found two in the same condition. Dr. Chil, from the Canary Islands, said that perforated skulls had been found in the ancient burial-places of his country. Notice was also called to an example from the grotto of Lorde, upon which M. Hamy and M. Chaplain-Duparc gave some interesting details. A similarly perforated or trepanned skull was found by Mr. E. G. Squier among some ancient Peruvian crania collected by him."

The original report I have not seen; but the concluding remark, on the Peruvian skull, removes some doubt as to the kind of perforation described. In the well-known instance discovered by Mr. Squier, the character and the meaning of the operation (trepanning, the excision having been made during the lifetime of the individual) are so evident, and the shape (rectangular) and the position (on the left side of the frontal bone) so different from that of the perforations which I have described in the crania from Michigan, that I never for a moment associated them, and therefore made no reference to the Peruvian skull. The same view, we may presume, was taken by the learned persons to whom I referred my discoveries, who could scarcely be supposed ignorant of the case in question.

I find no positive statement as to the position of the perforations mentioned at the meeting of the French Association; but judge from certain remarks that (again unlike our instances from Michigan) there was no constant position observed. In certain cases of trepanning the position, of course, must have varied with the location of the injury to be operated on.

In short, the perforation which I find in the Michigan crania is exceptional — rarely present; it is simply a circular hole about half an inch (more or less) in diameter, apparently rudely bored, invariably in the top of the head of adults, and made after death; while those cases described in France, though only so recently

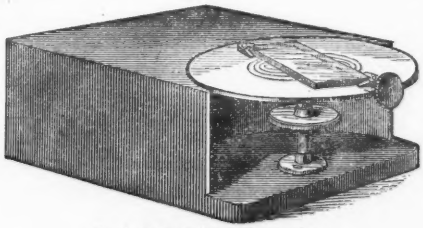
brought to notice, are quite numerous, and appear to be what may be more correctly termed trepanning, that is the part of the skull operated on was removed entire, and all ages are represented.

I have purposely refrained from much mention of my speculations on this custom of our aboriginal people; yet I have thought that the superstition of the modern North American Indian in regard to there being two souls, one of which visits the body after death, may throw some light on the subject. We know that the coverings of their graves, made of wood or bark, always have a perforation at one extremity for the supposed entrance and egress of the soul. But the question arises — Why, then, is not the perforation of the skull constant, or at least more frequent? — HENRY GILLMAN, *Detroit, Michigan*.

MICROSCOPY.

A NEW SELF-CENTRING TURN-TABLE. — Mr. C. F. COX, of New York, has contrived a turn-table which centres the slide unerringly, and is at the same time a convenient working instrument. The slide is held, by pressure upon two diagonally opposite corners, between two clutches that are made, by a right and left screw, to move toward or from the centre simultaneously and at a uniform rate. The centre of revolution must therefore coincide with the centre

Fig. 210.



Cox's Self-centring Turn-table.

of the diagonal of the slide which is the exact centre of a truly rectangular slide, and is practically the centre of any slide fit to be used. This very useful piece of apparatus is, fortunately for the taste of its inventor and for the convenience of other microscopists, unencumbered by a patent; and it has been already constructed by Miller Bros. and by J. W. Queen & Co. The style made by the latter firm is figured in the accompanying cut.

For all new work, such as making varnish cells or centring cells or objects of any kind, this turn-table seems worthy to supersede all previous forms. For repairing old work, which may not be well centred originally, it should be provided with a spring clip under which a mounted object can be centred by the concentric circles in the usual manner, and which, when not in use, can be removed entirely from the table. By a general adoption of such a table much of the annoyance incidental to revarnishing slides would be avoided.

NOTES.

Prof. D. S. Jordan has prepared, for the Report for 1874 of the Indiana State Geological Survey, a preliminary list of the fishes which he has found in Indiana, also including those likely to be obtained in the waters of the state. This list is prepared for the purpose of inducing local collectors to examine the streams and lakes of the state. While all such local lists are much wanted, we think a mistake is made in using the "Key" system for the means of identification. Why is it not just as well to give the characters of the orders, families, genera and species, and thus teach the collector as he works out his specimens, instead of making him follow out a series of artificial groups until he finds something that will answer to the specimen he has in hand. The labor by the last method is not lessened, and when the end is reached only a name is secured, whereas by the former method the name is found as readily, and much has been learned in hunting it out.

The Trustees of the Metropolitan Museum of Art (New York), have recently issued two instructive pamphlets, which also illustrate the riches in their keeping. One of these is a "Guide to the Cesnola Collection," and gives a general account, with a number of cuts, of this most valuable collection of ancient art from the excavations made on the Island of Cyprus. This collection was purchased by the Museum for about $50,000, and is the result of seven years labor on the part of General Cesnola, during which time over eight thousand Phœnician tombs were opened. These tombs were situated six and one-half feet below the more recent Greek tombs, and the most recent date given to them is about 800 or 1,000 years before Christ. The other, and much larger, pamphlet is a "Hand Book for the use of visitors examining Pot-

tery and Porcelain in the Museum," and contains much valuable information relative to both ancient and modern pottery.

The Peabody Museum of Archæology and Ethnology at Cambridge, has recently received from Mr. Alexander Agassiz, a very large and important collection made by himself and Mr. Garman during the past winter, and illustrating the archæology and ethnology of ancient and modern Peru. A large number of vases, several mummies, and articles of various kinds found in the graves, were obtained from ancient burial grounds near the coast. Some very interesting vessels were secured at Lake Titicaca, and a number of human crania were taken from the burial towers near the lake; while the collection of articles now in use by the Indians gives the means of comparing the past with the present. This very valuable addition will not be arranged until the cases in Boylston Hall, recently occupied by the Wyman Anatomical Museum, are fitted for the reception of the specimens belonging to the Peabody Museum.

Prof. H. A. Ward, of Rochester, has just issued a new catalogue of osteological preparations, which shows the immense facilities at his control in the way of furnishing skeletons, skulls and special preparations, to those who wish to obtain specimens for their own study or for schools and museums. Until Prof. Ward's establishment was started, Americans were dependent on Paris for such specimens, but now anything, from a skeleton of a man down to that of a fish, can be had at fair prices by sending to Rochester, New York.

The Cincinnati Quarterly Journal of Science for July contains a very readable article on the "Atlantis" tradition as given by Plato, and its bearing on the supposed early intercourse between the prehistoric civilizations of the old world and America. The author, Mr. L. M. Hosea, advocates the former relations between the ancient races of America and the old Egyptians, and points out many resemblances between the two civilizations.

In the forthcoming report by the State Geologist of Indiana, of which we have been favored with advance sheets, Professor Cox describes and gives plans of the several ancient works in Indiana of which mention was made in our last number. Professor Cox also describes and figures in the same report a number of Pipes of

the Mound builders, and he is entitled to much credit in thus making known the antiquities of the state.

THE excursion of the Cambridge Entomological Club to the White Mountains started on July 8. About thirty persons, including ladies, will remain in camp for three or four weeks. The camp will be located near the Half-way House on Mt. Washington, and in an interesting field for collecting.

THE Cincinnati Society of Natural History have recently received a bequest of $50,000 from Mr. Charles Bodman of Cincinnati. As no conditions are attached to the bequest the Society will be placed in a position that will enable it to do much for the advancement of science in the west.

AT a recent meeting of the Trustees of the Peabody Academy of Science, Professor Gray, who was one of the original Trustees, withdrew from the board, and Dr. Coggswell of Bradford, and Mr. John Robinson of Salem, were elected to fill vacancies.

THE distinguished geologist, Sir William Logan, for many years the head of the Geological Survey of Canada, died at Ontario, on June 28th.

BOOKS RECEIVED.

Report of Progress of the Mineralogical, Geological and Physical Survey of the State of Georgia, for the period from Sept 1, *to Dec.* 31, 1874. By George Little. 1875. pp. 36. 8vo.

Practical Hints on the Selection and Use of the Microscope. By John Phin. New York, 1875. pp. 131. 8vo.

Cactus: Its History, Classification, Proving and Therapeutical Application. Read before the Eclectic Medical Society of the State of New York, Oct. 22, 1874. By Richard E. Kunze. Albany, 1875. pp. 33. 8vo.

Revue Scientifique de la France et de l'Etranger. 15, 29, Mai, 1875.

Academie Royale des Sciences, des lettres et des Beaux Arts de Belgique. Memoires des Membres. Vol. 40. 1873. 4to. *Memoires couronnes et des savants etrangers.* Vols. 37, 38. 1873-74. 4to. *Memoires couronnes et autres memoires.* Vol. 23. 1873. 8vo. *Bulletins de l'Academie.* 2d series. Vols. 35, 36, 37. 1873-74. 8vo. *Annuaire de* 1874. 8vo.

Annales Meteorologiques de l'Observatoire Royal de Bruxelles. Annee 1872, 1873. 4to.

Congres International de Statisque. Par A. Quetelet. Bruxelles, 1873. 4to.

Academie Royale de Belgique. Observations des Phenomenes Periodiques pendant l'annee 1872. 4to.

La Comete de Coggia observee a Bruxelles. Par Ernest Quetelet. 8vo.

Les Observations Meteorologiques Simultanees sur l'Hemisphere Terrestre Boreal. Par Ernest Quetelet. 8vo.

Notices extraites de l'Annuaire de l'Observatoire Royal de Bruxelles pour 1874. Par A. Quetelet. 16mo.

Sitzungsberichte der math. naturw. 1874. I, Abtheil, Nos. 4, 5, 6, 7. II. Abtheil, Nos. 4, 5, 6, 7. III. Abtheil, 1-5, 6, 7.

Jahrbuch der k. k. geologischen Reichsanstalt. Wien, 1874. xxiv Band. 8vo.

Verhandlungen der k. k. geologischen Reichsanstalt. No. 16. 1874. 8vo.

Entomologische Zeitung. Herausgegeben von dem entomologischen Vereine zu Stettin. 1874. 8vo.

Bulletin de la Societe Vandoise des Sciences Naturelles. Lausanne, 1874. 2e S. Vol. xiii, No. 73. 8vo.

Annales de l'Institut Meteorologique de Norvege. Christiania, 1871, 1872, 1873, 1874.

Postola Sogur, Legendariske Fortællinger om Apostlernes Liv Deres Kamp for Kristendommens Udbredelse Samt Deres Martyrdod. By C. R. Unger. Christiania, 1874. pp. 966. 8vo.

Det Kongelige Norske Videnskabers Selskabs Skrifter i det 19 *de Aarhundrede.* 7th Band. Throndlyiu 1872. pp. 240. 8vo.

Geologiske Undersgelser inden Troms Amt og tilgraendsende Dele af Nordlands Amt iv af Karl Pettersen. 8vo.

Index Scholarum in Universitate Regia Fredericiana Centesimo Vicesimo Eins Semestri Anno 1873, 1874, 1875. Christiania. 8vo.

On Giants' Caldrons. By S. A. Sexe. Christiania, 1874. 8vo.